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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup> :</b> <b>A23L 1/29, 1/20, A61K 35/78</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 96/10341</b> <b>(43) International Publication Date:</b> 11 April 1996 (11.04.96)
<b>(21) International Application Number:</b> PCT/NL95/00333 <b>(22) International Filing Date:</b> 3 October 1995 (03.10.95)  <b>(30) Priority Data:</b> 9401618 3 October 1994 (03.10.94) NL 08/509,803 1 August 1995 (01.08.95) US  <b>(71) Applicant (for all designated States except US):</b> SCHOUTEN INDUSTRIES B.V. [NL/NL]; Burgstraat 12, NL-4283 ZG Giessen (NL). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> VAN HAASTER, Joseph, Nicolaas [NL/NL]; Kennemerstraat 47, NL-1851 BA Heiloo (NL).  <b>(74) Agent:</b> VAN SOMEREN, Petronella, Francisca, Hendrika, Maria; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).		<b>(81) Designated States:</b> AM, AU, BB, BG, BR, BY, CA, CN, CZ, EE, FI, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LV, MD, MG, MN, MX, NO, NZ, PL, RO, RU, SD, SG, SI, SK, TJ, TM, TT, UA, UG, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).  <b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
<b>(54) Title:</b> FOOD AND HEALTH PRODUCTS  <b>(57) Abstract</b>  The invention relates to food or health products, comprising substantially pure hypocotyls of the seeds of <i>Glycine max.</i> , wherein the hypocotyls are optionally further subjected to a processing step such as toasting, steaming, roasting, milling, breaking, agglomerating, coating or combinations thereof. The hypocotyls may be obtained in a substantially pure form by breaking the seeds of <i>Glycine max.</i> , sieving the thus obtained product to obtain a first fraction, comprising larger cotyledon fragments, and a second fraction, comprising the hypocotyls, smaller cotyledon fragments and testa, removing the smaller cotyledon fragments and testa by a separation step based on the differences in floating behavior in an air flow and optionally performing a processing step thereon.		

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**FOOD AND HEALTH PRODUCTS**

The present invention relates to food or health products, and to prophylactic compositions.

5           Research into the occurrence of various forms of cancer in Western Europe and Northern America as compared to the Far East countries has led to the conclusion that the differences in daily diet may play an important role in the development of cancer. In the  
10 Western countries food products mainly originate from animal sources, whereas in Eastern countries a significantly higher amount of plant products are consumed. This led to the observation that there is a high correlation between the type of food products,  
15 especially proteins, consumed (animal versus plant) and the occurrence of breast and prostate cancer. Furthermore, it was found that urine of Japanese men contains high amounts of phyto-oestrogens (plant hormones).

20           The conclusion is that it appears advisable to supplement the Western diet with plant proteins and plant hormones.

It is the object of the invention to provide a source for plant hormones to be used in various products,  
25 such as food products, health products and prophylactic compositions.

It has now been found according to the invention that hypocotyls of Glycine max. are a very suitable source for these plant hormones. However in  
30 order to avoid undesirable side-effects it is important to start with very pure hypocotyls.

The invention therefore provides hypocotyls in a substantially pure form obtainable by breaking the seeds of Glycine max., sieving the thus obtained product  
35 to obtain a first fraction, comprising larger cotyledon fragments, and a second fraction, comprising the hypocotyls, smaller cotyledon fragments and testa, removing the smaller cotyledon fragments and testa by a

separation step based on the differences in floating behavior in an air flow and optionally performing a processing step thereon.

The thus obtained hypocotyls are very pure, the  
5 purity may even be as high as 85%, preferably 90%, more preferably 95% and most preferably even 99% or higher. Due to this high degree of purity the relative amount of isoflavones in the hypocotyls of the invention is higher than reported previously.

10 Although it is known to isolate the various active components from the hypocotyls and use these in food supplements, it was never disclosed to use the complete hypocotyl as an ingredient in food and health products. Furthermore, until the present invention it was  
15 not possible to provide hypocotyls in a very pure form.

The hypocotyls contain various valuable components, such as the isoflavones diadzin, genistin and glycitin or their esters and aglucons, as well as tocopherols and saponines.

20 Isoflavones can inhibit or prevent the onset of certain types of cancer and negatively affect the growth of tumors. Research (Hirayama, 1986) showed in a test with 143.000 women in Japan that the chance to develop breast cancer was smaller if the consumption of soya  
25 products was higher. An analogous result was obtained for prostate cancer (Sharma et al., 1992). Furthermore it was found that the consumption of soya products significantly delayed the progression of the disease.

Research by S. Barnes (unpublished results)  
30 showed that the ingredients of soya products responsible for the above effects are indeed the isoflavones. A soya protein concentrate from which the isoflavones were removed had no effect on the development of uterine cancer, whereas an unrefined concentrate had. V. Steele  
35 (unpublished results) showed that a high amount of isoflavones in the diet caused a decrease in abnormal crypts in the large intestine. Poole (1989) and Hu et al. (1991) found a protective effect.

Studies in the Chinese miners community demonstrated that a higher consumption of soya products led to a decreased chance to develop lung cancer (Swanson et al., 1992).

5           Animal tests, in which chemicals were used to induce tumors in liver and gall (Becker et al., 1981; Mokhtar et al., 1988) demonstrated that animals on a high isoflavone diet did not develop such disorders, whereas animals on two low-isoflavone diets did in 27% and 40% of  
10 the cases. Isoflavones are furthermore known to have a negative effect on the symptoms of the menopause, and reduces the chance to develop arteriosclerosis. They also influence the cholesterol metabolism.

          The isoflavones are chemically related to  
15 oestrogens and can compete in the body for the oestrogen receptors. However, isoflavones do not induce oestrus. Genistin has less than 1% of the oestrus generating effect in mice as compared to oestrol, and daidzine has less than 10 to 20% of the activity of genistin. They  
20 compete with endogenous hormones for receptor sites but without generating the same effect.

          According to the literature the isoflavone content of hypocotyls of Glycine max. seeds amounts to 1250 mg/100 g hypocotyls. The substantially pure  
25 hypocotyls of the invention have been found to have a much higher content of isoflavones of 1636 mg/100 g hypocotyls, and also contents of 2400 to 2900 mg/100 g hypocotyls have been found in analysis. The latter hypocotyls are more than 99% pure. Because of this high  
30 purity it is now practically possible to isolate sufficient quantities of glycitin to do experimental research.

          A recommendable daily amount of isoflavones is about 50-300, preferably 75-200, more preferably about  
35 100 mg.

          Tocopherols are known to possess vitamin E ( $\alpha$ -tocopherol) and anti-oxidant activity. Tocopherols exist in various forms. Hypocotyls of Glycine max. are very

rich in  $\alpha$ -,  $\beta$ -,  $\gamma$ -, and  $\delta$ -tocopherol. Especially the presence of the very active  $\delta$ -tocopherol in the hypocotyls of Glycone max. is highly advantageous. The Glycine max. tocopherols are very stable and have  
5 therefore a long shelf-life. Tocopherols are supposed to be protective against coronary heart diseases.

The saponines are claimed to have curative properties against diseases of the immunosystem.

The substantially pure hypocotyls of the  
10 invention may form the basis of or be the active ingredient in various types of products, such as tablets, capsules, drinks, powders, candy bars, dairy products, breakfast cereals, food supplements, muscle developers, fermentation products, veterinary products, pet feed  
15 supplements, homeopathic products, bakery products, health teas, hydrolysates etc..

The pure hypocotyls may be subjected to a further processing step, such as toasting, steaming, roasting, milling, breaking, agglomerating, coating or  
20 combinations thereof. Processing methods that require heat lead to an inactivation of unwanted components such as trypsin inhibitor etc.. At the same time valuable flavors may develop, similar to the flavour of walnuts and other nuts. This is especially the case if the  
25 hypocotyls are roasted.

The hypocotyls may also be used for isolating the isoflavones and/or tocopherols and/or saponines therefrom. Both the hypocotyls and isolated components thereof may be used in prophylactic, therapeutical and  
30 homeopathic compositions.

The present invention will be further elucidated in the following examples which are given for illustration purposes only and are not intended to limit the scope of the invention.

**EXAMPLES****EXAMPLE 1****Preparation of hypocotyls according to the invention**

5           Seeds of Glycine max. were sifted on a sieving machine having screens with a sieve width of 6 mm to remove unwanted components. The purified seeds were then broken by a crushing roller to obtain 2 to 20 pieces per seed. The broken seeds were sifted on a sieving machine  
10 with screens having apertures of 1 to 2 mm diameter. The intermediate fraction was freed of testae and hilums by means of an air separator. The remaining fraction was further purified by means of a gravity table.

          The thus obtained hypocotyls have a purity of  
15 99%. Their content of isoflavones were determined by HPLC as described by Setchell et al. (1987). The results are shown in the following table.

20	Isoflavone	Concentration
	Daidzin	13.11 mg/ml
	Genistin	2.47 mg/g
	Daidzein	0.71 mg/g
	Genistein	0.07 mg/g
	Total	16.36 mg/g

25

The purified hypocotyls were roasted in hot air of 200 to 230°C. The thus obtained product may be used as ingredient for breakfast cereals, candy bars, bakery products and teas.

30           As an alternative the hypocotyls may be dried and pulverized to obtain a powder for use in various food and health products, homeopathic products, veterinary products, fitness products, pet feed supplements. As a further alternative the hypocotyls may be extracted,

puffed, swollen, hydrolysed and/or fermented for use in  
therapeutical or preventive applications.

**EXAMPLE 2**

5 Tomato juice cocktail

A functional food product, especially intended  
for body-builders, in the form of a tomato juice cocktail  
was prepared from the following ingredients: water,  
tomato concentrate, extracts of walnuts, carrots,  
10 cabbage, Brussels sprouts, broccoli, garlic, orange  
(oil), salmon (oil), green tea, rice, cherries, licorice  
and soy lecithin, natural flavors, natural  $\beta$ -carotene,  
natural vitamin E and 0.6% of an extract of the  
hypocotyls of Glycine max.. The product contained 10 mg  
15 genisteine/daidzeine as glucosides per can of 163 ml.



**EXAMPLE 3****Capsules containing the hypocotyls**

In the previous example the hypocotyls of Glycine max. were used as an extract as an ingredient in  
5 a drink. As an alternative the pure hypocotyls may be used as the sole ingredient in capsules to be used as food supplements. These capsules contain 100% hypocotyls and have thus a very high content of isoflavones, tocopherols and saponines.

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## CLAIMS

1. Food or health product, comprising substantially pure hypocotyls of the seeds of Glycine max..
- 5           2. Food or health product as claimed in claim 1, wherein the hypocotyls are further subjected to a processing step such as toasting, steaming, roasting, milling, breaking, agglomerating, coating or combinations thereof.
- 10           3. Food or health product as claimed in claim 1 or 2, wherein the hypocotyls are obtainable in a substantially pure form by breaking the seeds of Glycine max., sieving the thus obtained product to obtain a first fraction, comprising larger cotyledon fragments, and a  
15 second fraction, comprising the hypocotyls, smaller cotyledon fragments and testa, removing the smaller cotyledon fragments and testa by a separation step based on the differences in floating behavior in an air flow and optionally performing a processing step thereon.
- 20           4. Food or health product as claimed in claim 1 to 3, wherein the product is in a form selected from the group consisting of tablets, capsules, drinks, powders, candy bars, dairy products, breakfast cereals, food supplements, muscle developers, fermentation products,  
25 veterinary products, pet feed supplements, homeopathic products, bakery products, health teas, hydrolysates.
- 30           5. Substantially pure hypocotyls of the seeds of Glycine max. obtainable by breaking the seeds, sieving the thus obtained product to obtain a first fraction, comprising larger cotyledon fragments, and a second  
fraction, comprising the hypocotyls, smaller cotyledon fragments and testa, removing the smaller cotyledon fragments and testa by a separation step based on the differences in floating behavior in an air flow and  
35 optionally performing a processing step thereon.
6. Substantially pure hypocotyls as claimed in claim 5 for use in food products.

7. Substantially pure hypocotyls as claimed in claim 5 for use in health products.

8. Substantially pure hypocotyls as claimed in claim 5 for use in prophylactic compositions.

5 9. Substantially pure hypocotyls as claimed in claim 5 for use in homeopathic products.

10. Substantially pure hypocotyls as claimed in claim 5 for use as a raw material for the isolation of isoflavones, such as daidzin, genistin and glycitin.

10 11. Substantially pure hypocotyls as claimed in claim 5 for use as a raw material for the isolation of tocopherols and/or saponines.

12. Use of pure hypocotyls as claimed in claim 5 for the preparation of prophylactic compositions.

15 13. Prophylactic composition comprising as an active ingredient substantially pure hypocotyls of the seeds of Glycine max., and a suitable excipient.

14. Method for manufacturing substantially pure hypocotyls of the seeds of Glycine max., comprising the  
20 steps of breaking the seeds, sieving the thus obtained product to obtain a first fraction, comprising larger cotyledon fragments, and a second fraction, comprising the hypocotyls, smaller cotyledon fragments and testa, removing the smaller cotyledon fragments and testa by a  
25 separation step based on the differences in floating behavior in an air flow and optionally performing a processing step thereon.

# INTERNATIONAL SEARCH REPORT

Intern. Application No  
PCT/NL 95/00333

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 A23L1/29 A23L1/20 A61K35/78

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 6 A23L A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO,A,93 23069 (G.E.KELLY) 25 November 1993 see page 9, line 2-3; claims 1,2,5,8; examples 2,4 see page 10, line 22 see page 12, paragraph 3 - page 13, paragraph 1 see page 13, paragraph 4 - page 14, paragraph 1 ---	1-14
X	DATABASE WPI Section Ch, Week 8613 Derwent Publications Ltd., London, GB; Class D13, AN 86-084456 & JP,A,61 030 593 ( PELICAN KK) , 12 February 1986 see abstract --- -/--	1,11

☒ Further documents are listed in the continuation of box C.

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information on patent family members

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		EP-A- 0656786	14-06-95
		JP-T- 7506822	27-07-95
		NO-A- 944435	18-11-94
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